REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the present amendments and following discussion, is respectfully requested.

Claims 1-14 are pending. No claims are amended, and no new matter is added.

In the outstanding Office Action, Claims 1, 2, 4-6, 8, 9, 11, and 14 were rejected under 35 U.S.C. §102(a) as anticipated by Buldhaupt et al. (U.S. Patent No. 6,419,146, herein "Buldhaupt"). Claims 1, 2, 4-6, 11, and 14 were rejected under 35 U.S.C. §102(b) as anticipated by Will et al. (U.S. Patent No. 6,138,898, herein "Will"). Claims 7, 12, and 15 were rejected under 35 U.S.C. §103(a) as obvious over Buldhaupt. Claims 3, 10, 12, 13, and 15 were rejected under 35 U.S.C. §103(a) as obvious over Buldhaupt in view of Sanders (U.S. Patent Pub. 2002/0179688) in view of Weisert et al. (U.S. Patent No. 4,220,276, herein "Weisert").

Regarding the rejection of Claim 1 as anticipated by Buldhaupt, that rejection is respectfully traversed by the present response. Independent Claim 1 recites:

> A method of fabricating a hollow mechanical part by diffusion welding and superplastic forming, the method comprising the following steps:
>
> a) providing at least two primary parts of superplastic material, said primary parts having two faces and a periphery;
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> b) providing an anti-diffusion substance and depositing said anti-diffusion substance in a predefined pattern on at least one face of said two faces of said primary parts;
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> c) assembling said primary parts together at their said periphery, with the exception of a passage-forming location, said primary parts forming a stack and defining between them a cavity, said at least one face being placed facing into said cavity;
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> d) diffusion welding the stack under isostatic pressure;
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> d) placing the welded assembly in a mold; and
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> f) raising said mold to the superplastic forming temperature and injecting an inert gas at the superplastic forming pressure via said passage into said cavity, thereby causing the stack to inflate and implementing superplastic forming, enabling a blank of the mechanical part to be obtained;
>
> wherein step b) is performed in application of the following sequence of operations:

> b1) applying a layer of anti-diffusion substance comprising a powder over the entire surface of said at least one face of the primary parts;
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> b2) localized sintering of the anti-diffusion substance in said predefined pattern by the heating that results from localized application of a laser beam along a track made up of at least one zone, thereby producing, in said at least one zone, both bonds between the particles of powder and also a diffusion phenomenon between the particles of powder and the material of said at least one face of the primary part; and
>
> b3) removing the anti-diffusion substance from the regions that are not subjected to the laser beam.

Accordingly, the anti-diffusion substance is deposited in a predefined pattern on at least one face of the primary parts. **The anti-diffusion substance is sintered by localized application of a laser beam.** The sintering produces bonds between particles of powder in the anti-diffusion substance and bonds between the material and the face of the primary part.

One benefit of the above-note method is improved control over the area in which the anti-diffusion substance is deposited without the need to greatly control the viscosity of the anti-diffusion substance.[1] Another benefit is improvement in the conditions in which the diffusion-welding step is performed, and in particular, reduction in sources of contamination of the assembled surfaces prior to raising them to the diffusion-welding temperature.[2] Additionally, the above-noted arrangement enhances the ability to deposit the anti-diffusion substance in predefined patterns in a manner that is simple, reliable, and highly accurate, in particular with patterns that are very sharp along their edges.[3]

The outstanding Office Action points to Buldhaupt, col. 4, line 43-col. 6; line 22, col. 7, lines 40-66; and col. 8, line 33-col. 9, line 19, for the above-noted features, and the outstanding Office Action emphasizes col. 5, lines 40-54, in the response to arguments section, as supporting the assertion that Buldhaupt describes laser sintering a "stop-off" material.[4] The outstanding Office Action also asserts that Buldhaupt does not teach that the

[1] Published specification, numbered paragraph [0027].
[2] Published specification, numbered paragraph [0028].
[3] Id.
[4] Outstanding Office Action, pages 2 and 5.

stop-off is kept away from the laser.[5] The section of Buldhaupt emphasized in the outstanding Office Action states:

> When curved panels are being made, it may be desirable to coat one side of one of the core sheets 44 and 46 with a stop-off compound such as boron nitride to prevent unintended diffusion bonding. For large area surfaces, the boron nitride may be dissolved in a solvent such as a mixture of water and alcohol and sprayed with an electrostatic sprayer onto the entire surface area of the one side of the one sheet. The water and alcohol evaporate, leaving a thin even coating of boron nitride on the surface of the titanium sheet. For smaller surfaces, the stop-of may be sprayed from an aerosol can of a solution of boron nitride in an alcohol solution that is commercially available from the Cerac Company in Milwaukee, Wisconsin. The stop-off, if used, is carefully excluded from the region between the sheets 44 and 46 where the hardpoint 40 is to be, since diffusion bonding in that area is desired.
>
> The coated sheet is aligned with and abutted against the other sheet, with the boron nitride coated face facing the other sheet. The two core sheets 44 and 46 are laser welded in the pattern shown in FIGS. 2 and 4 on a laser welding apparatus shown in FIGS. 6A and 6B, purchased from Convergent Energy Corp. in Sturbridge, Mass. The apparatus 59 includes a CNC motion control table 60 on which the sheets 44 and 46 are placed and secured in an 2 aligned stack. A vertically extendable clamping actuator such as a powered plunger is mounted over the table 60. The plunger has a fitting on which a pressure trolley 62, shown in more detail in FIGS. 7 and 8, is mounted for exerting a vertical force on the sheets to press them into intimate contact during laser welding by a laser beam aimed vertically downward through the center of the trolley 62 at the table.[6]

Accordingly, the stop-off, if used, is carefully excluded from the region between sheets (44) and (46) where the hardpoint (40) is to be because fusion bonding in that area is desired. In other words, the area to which the laser will be applied is carefully kept free of stop-off material.

Applicants respectfully submit that a person of ordinary skill in the art would understand that it is, by definition, impossible to weld an area where there is stop-off material. A person of ordinary skill in the art would know that a weld obtained in an area where there is stop-off material would contain, after cooling, stop-off particles, which would

[5] Outstanding Office Action, page 5.
[6] Buldhaupt, col. 5, lines 24-54.

act as stress raisers. As a result, the fatigue life of such a weld would be quite low. Thus, a person of ordinary skill in the art would not put stop-off material in an area in which a weld is to be made, and Buldhaupt explains this when it says "[t]he stop-off, if used, is carefully excluded from the region between the sheets 44 and 46 where the hardpoint 40 is to be, **since diffusion bonding in that area is desired**."[7] Accordingly, Applicants respectfully submit that independent Claim 1 patentably distinguishes over Buldhaupt for at least the reasons discussed above.

Additionally, the outstanding Office Action asserts that the laser in Buldhaupt sinters the stop-off.[8] The laser in Buldhaupt is used to weld or diffusion bond **two metal sheets** together. Buldhaupt states:

> These and other objects of the invention are attained in a superplastically formed, diffusion bonded sandwich structure having an integral metal hardpoint, made by joining at least two superplastic metal sheets together into a pack of three or more sheets by welding or diffusion bonding the two sheets along a pattern of lines which form junction lines between the sheets when the pack is inflated by gas pressure at superplastic temperatures. At least one metal insert is interposed between at least two of the sheets and all of the sheets in the pack are sealed together around an outside peripheral edge to create a gas tight envelope. The pack is heated to superplastic temperatures and the top and bottom face sheets are diffusion bonded to top and bottom surfaces of the metal insert by application of heat and pressure from top and bottom inner surfaces of the die cavity. While at superplastic temperatures, the pack is inflated by gas pressure against inside surfaces of a die to form an expanded metal sandwich structure having integral webs and an integral hardpoint formed by the metal insert. After forming, the gas pressure is vented, the part is cooled below superplastic temperature and is removed from the die.[9]

Thus, Buldhaupt is concerned with bonding the metal sheets together, not bonding the stop-off material. Applicants respectfully submit that **sintering** of the **stop-off material** is not mentioned in Buldhaupt. Accordingly, Applicants respectfully submit that independent Claim 1 patentably distinguishes over Buldhaupt for at least this additional reason.

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[7] Buldhaupt, col. 5, lines 36-39 (emphasis added).
[8] Outstanding Office Action, page 2.
[9] Buldhaupt, col. 2, lines 29-49.

Independent Claim 14 recites substantially similar features to those discussed above regarding independent Claim 1 and patentably distinguishes over Buldhaupt for at least the same reasons as independent Claim 1 does.

Claims 2-13 and 15 each depend from one of independent Claims 1 and 14 and patentably distinguish over Buldhaupt for at least the same reasons as Claims 1 and 14 do.

As for the rejection of dependent Claims 3, 10, 12, 13, and 15 as obvious over Buldhaupt in view of Sanders and Weisert, that rejection is respectfully traversed.

The outstanding Office Action relies on Sanders and Weisert for the specific composition and particle size of the anti-diffusion material. However, neither Sanders nor Weisert teaches or suggests sintering anti-diffusion material as recited in independent Claims 1 and 14. Rather, Sanders uses standard silk-screening to apply stop-off material where bonding is unwanted, and Sanders does not use a laser to sinter the stop-off material. Weisert describes applying a stop-off material in a conventional manner and does not use a laser to sinter the stop-off material. Accordingly, Applicants respectfully submit that neither Weisert nor Sanders remedies the deficiencies discussed above regarding Buldhaupt, and dependent Claims 3, 10, 12, 13, and 15 patentably distinguish over any reasonable combination of the cited references for at least the same reasons as independent Claims 1 and 14 do.

Regarding the rejection of Claims 1, 2, 4-6, 11, and 14 as anticipated by Will, that rejection is respectfully traversed by the present response.

The outstanding Office Action asserts that Will describes coating an entire sheet with stop-off material, and then bonding sections of the sheet that are coated with the stop-off material. However, as discussed above regarding Buldhaupt, Applicants respectfully submit that a person of ordinary skill in the art would understand that areas to be bonded are not to be coated with a stop-off material because, by definition, the stop-off material is used to

reduce the tendency of the material to bond with another material. The outstanding Office Action points to Will, col. 6, lines 15-48, for the proposition that the entire sheet is coated with a stop-off, and that sections coated with the stop-off are bonded to the second sheet.[10] However, the cited section actually states that stop-off is not to be included in areas that are to be bonded (bonded by application of the laser). The section of Will cited in the outstanding Office Action states:

> Now referring to the drawing, in practicing the present invention, **the stopoff paint of Example 1 or the stopoff composition of Example 2 is applied to selected areas or strips 12 of a clean titanium alloy sheet or blank 10, to prevent bonding in those areas.** While other reactive metals could be used, this invention has been found to be particularly advantageous for use with a titanium alloy, such as Ti-6Al-4V. If the stopoff paint of Example 1 is used, it is applied by silk screening the paint by conventional silk screening procedure, e.g. in the form of strips, as indicated at 14, in any suitable configuration, over the preselected areas 12. **If the stopoff composition of Example 2 is employed, it is sprayed by suitable means onto the stopoff areas 12, employing suitable masking to protect those areas 16 of the titanium alloy sheet which are to be bonded, including the area between the strips 14 and the peripheral areas around the strips. Grooves 11 and 13 are provided in sheet 10 to allow for passage of pressurizing fluid to the stopoff network.**
>
> Referring to FIGS. 2 and 2a of the drawing, with the titanium alloy sheet 10 thus treated with the yttria stopoff composition according to the invention, utilized as the bottom sheet (it could alternately be the top sheet), a second clean titanium alloy sheet or blank 18 is placed as the top sheet, over the stopoff-treated sheet 10, with the sheet 18 in contact with the strips of stopoff composition 14, applied to the bottom sheet 10.
>
> The resulting assembly 20 of titanium alloy sheets 10 and 18, with the strips of stopoff composition 14 therebetween, are placed in a forming apparatus, generally indicated at 22, and having an upper tool 24 and a lower tool 26. The lower tool contains a plurality, here shown as two, die cavities 28. A gas inlet 30 is provided in communication with groove 11 for introducing gas into the stack or assembly 20 and a gas outlet 32 in communication with groove 13 is provided for exiting gas from the assembly.[11]

[10] Outstanding Office Action, page 6.
[11] Will, col. 6, lines 12-50 (emphasis added).

As discussed above regarding Buldhaupt, a person of ordinary skill in the art would know not to apply stop-off material where bonding is desired, and Will explains this point in the section quoted above.

Furthermore, like Buldhaupt, Will is devoid of any mention of **sintering** the stop-off material with a laser.

Accordingly, Applicants respectfully submit that independent Claims 1 and 14 patentably distinguish over Will for at least the reasons discussed above.

Claims 2, 4-6, and 11 each depend from independent Claim 1 and patentably distinguish over the Will for at least the same reasons as Claim 1 does.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance. An early and favorable action that effect is respectfully requested.

Respectfully submitted,

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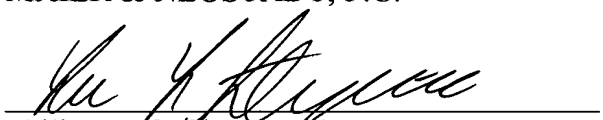

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